substantially uniform resonance spectrum.

In another aspect, the invention is a method of manufacturing hard disc drives having a reproducible resonance spectrum that includes the steps of providing a plurality of identical hard disc drive component sets, wherein each of said sets consists of components that are used in a single hard disc drive; placing and positioning one of said plurality of hard disc drive component sets in a mold cavity of an injection molding machine; closing said mold cavity; monitoring the pressure inside the mold cavity at an end-of-fill point; injecting a molten phase change material into said mold cavity to a pre-determined set point pressure; and repeating the steps above to produce a plurality of hard disc drives each having a substantially uniform resonance spectrum.

In yet another aspect, the invention is a method of reducing sympathetic system wide resonances of components in a hard disc drive that includes the steps of: providing a hard disc drive component; determining a desired resonance spectrum of said hard disc drive component; placing said hard disc drive component in a mold cavity of an injection molding machine having a controllable fill rate and a controllable injection pressure; closing said mold cavity; injecting a molten phase change material into said mold cavity at a fill rate and an injection pressure; monitoring the pressure in the mold cavity; and controlling the fill rate of said molten phase change material and injection pressure to obtain said hard disc drive component with the phase change material thereon, having said desired resonance spectrum.

The advantages of this invention are reduction in variance of resonance

spectrums of hard disc drive and other electrical components. This reduction in variance allows hard disc drive manufacturers the ability to better design hard disc drives. Resonance spectra of electrical and hard disc drive components may also be altered to reduce sympathetic system wide resonances. Other advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention an do not limit the scope of the invention, which is defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a partial cross-sectional view of a hard disc drive of the present invention.

FIG. 2 is a partial perspective view of a voice coil motor of the present invention.

FIG. 3 is a partial perspective view of a hard disc drive with the voice coil motor of FIG. 2.

FIG. 4a is a perspective view of a stator.

FIG. 4b is a perspective view of a stator substantially encapsulated in a monolithic body of phase change material of the present invention.

FIG. 5 is a cross-sectional view of an injection molding machine that may be used to practice the present invention.

FIG. 6a and 6b are cross-sectional views in open and closed positions of a mold cavity that could be used with the injection molding machine of FIG. 5.

FIG. 7 is a flowchart illustration of the preferred injection molding process of the present invention.

FIG. 8 is a graph illustrating the relationship between viscosity and flow rate for preferred polymers used in practicing the present invention.

FIG. 9a is a graph illustrating the pressure at the end-of-fill point for multiple cycles for an example injection molding process without control.

FIG. 9b is a graph illustrating the relationship between pressure and time in the runner and mold cavity for an example injection molding process without control.

FIG. 9c is a graph illustrating the pressure at the end-of-fill point for multiple cycles for an example injection molding process of the present invention.

FIG. 9d is a graph illustrating the relationship between pressure and time in the runner and mold cavity for an example injection molding process of the present invention.

FIG. 10 is a table illustrating the first order resonance frequency for encapsulated voice coil motors of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS AND PREFERRED EMBODIMENTS OF THE INVENTION

Referring to FIGS. 1 to 3, there is shown an embodiment of a product of the present invention comprising a hard disc drive system 10 having one or more parts that have a layer of phase change material thereon resulting in a more predictable system-wide resonance for the hard disc drive system 10. The hard disc drive system 10 is a combination of the hard disc drive components that make